

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Currently Amended) An injector system comprising:
a source of injection fluid;
a pump device;
a fluid path set disposed between the source of injection fluid and the pump device, and comprising a multi-position valve; and
a fluid control device operatively associated with the fluid path set and comprising a valve actuator ~~adapted~~ located to operate the multi-position valve, the valve actuator adapted to close the multi-position valve to isolate the pump device from a patient and stop flow of the injection fluid to the patient at substantially any pressure or flow rate generated by the pump device for delivering a sharp bolus of the injection fluid to the patient.
2. (Original) The injector system of claim 1 wherein the valve actuator is further adapted to selectively place the pump device in fluid communication with the source of injection fluid for supplying the injection fluid to the pump device.
3. (Original) The injector system of claim 1 wherein the valve actuator comprises a position indicator indicating a position of the multi-position valve.
4. (Original) The injector system of claim 1 wherein the valve actuator comprises a sensor indicating presence of the multi-position valve in the valve actuator.
5. (Original) The injector system of claim 1 wherein the valve actuator comprises a retainer for removably supporting the multi-position valve.

6. (Original) The injector system of claim 1 wherein the fluid path set comprises a drip chamber and the fluid control device comprises a fluid level sensing mechanism operatively associated with the drip chamber for sensing the injection fluid level in the drip chamber.

7. (Original) The injector system of claim 1 further comprising an air detector assembly operatively associated with the fluid path set.

8. (Original) The injector system of claim 1 wherein the pump device comprises a powered injector.

9. (Original) The injector system of claim 1, further comprising:
a source of medical fluid associated with the fluid path set; and
a pump operatively associated with the source of medical fluid for supplying the medical fluid to the patient via the fluid path set.

10. (Original) The injector system of claim 9 wherein the fluid path set comprises a drip chamber and the fluid control device comprises a fluid level sensing mechanism operatively associated with the drip chamber for sensing the medical fluid level in the drip chamber.

11. (Original) The injector system of claim 9 further comprising an air detector assembly operatively associated with the fluid path set.

12. (Original) The injector system of claim 9 further comprising a shut-off valve associated with the pump for stopping flow of the medical fluid to the patient.

13. (Original) The injector system of claim 12 wherein the shut-off comprises an automated pinch valve.

14. (Original) The injector system of claim 9 wherein the pump comprises a peristaltic pump.

15. (Original) The injector system of claim 9 wherein the fluid control device further comprises guides for securing the fluid path set in association with the pump.

16. (Original) The injector system of 1, further comprising a hand held control device for controlling the flow rate of the injection fluid from the pump device.

17. (Withdrawn) An injector system comprising:
a drip chamber comprising a body with a projection; and
a fluid level sensing mechanism comprising:
a drip chamber support for supporting the drip chamber body; and
a fluid level sensor associated with the drip chamber support, the drip chamber support adapted to support the drip chamber body such that the projection is operatively associated with the fluid level sensor.

18. (Withdrawn) The injector system of claim 17 wherein the projection extends longitudinally along the drip chamber body.

19. (Withdrawn) The injector system of claim 17 wherein the fluid level sensor comprises an ultrasonic or optical fluid level sensor.

20. (Withdrawn) The injector system of claim 17 wherein the drip chamber support is adapted to support the drip chamber body such that the projection is in contact with the fluid level sensor.

21. (Withdrawn) An air detector assembly for a fluid control device comprising:
an air column detector adapted to detect the presence of air in medical tubing; and
a retaining device for securing the medical tubing in operative association with

the air column detector, the retaining device comprising:

a base adapted for association with the air column detector; and

a closure member connected to the base and adapted to secure the medical tubing in operative association with the air column detector.

22. (Withdrawn) The air detector assembly of claim 21 wherein the closure member is movable from a closed position wherein the closure member secures the medical tubing in operative association with the air column detector, and an open position allowing the medical tubing to be disassociated from the air column detector.

23. (Withdrawn) The air detector assembly of claim 22 wherein the closure member is biased to the open position and secured in the closed position by a releasable locking mechanism.

24. (Withdrawn) The air detector assembly of claim 22 wherein the closure member is secured in the closed position by a releasable locking mechanism.

25. (Withdrawn) The air detector assembly of claim 21 wherein the closure member is formed of substantially clear plastic material to permit viewing of the medical tubing.

26. (Currently Amended) A fluid control device for connecting a pump device to a source of injection fluid comprising:

a fluid path set comprising a multi-position valve adapted to associate a patient and the source of injection fluid with the pump device; and

a valve actuator ~~adapted~~ located to operate the multi-position valve to selectively isolate the pump device from the patient and place the pump device in ~~fluid communication~~ association with the source of injection fluid for supplying the injection fluid to the pump device.

27. (Original) The fluid control device of claim 26 wherein the valve actuator comprises a position sensor indicator indicating a position of the multi-position valve.

28. (Original) The fluid control device of claim 26 wherein the valve actuator comprises a sensor indicating presence of the multi-position valve in the valve actuator.

29. (Original) The fluid control device of claim 26 wherein the valve actuator comprises a retainer for removably supporting the multi-position valve.

30. (Original) The fluid control device of claim 26 further comprising a fluid level sensing mechanism adapted to sense a level of fluid in at least one drip chamber associated with the fluid path set.

31. (Original) The fluid control device of claim 30 wherein the at least one drip chamber comprises a body with a projection, and the fluid level sensing mechanism further comprises:

a drip chamber support adapted to support the at least one drip chamber; and

at least one fluid level sensor associated with the drip chamber support, the drip chamber support adapted to support the at least one drip chamber such that the projection is operatively associated with the at least one fluid level sensor.

32. (Original) The fluid control device of claim 31 wherein the projection extends longitudinally along the body.

33. (Original) The fluid control device of claim 31 wherein the at least one fluid level sensor comprises an ultrasonic or optical fluid level sensor.

34. (Original) The fluid control device of claim 31 wherein the drip chamber support is adapted to support the at least one drip chamber such that the projection is in contact with the at least one fluid level sensor.

35. (Original) The fluid control device of claim 31 wherein the fluid path set comprises a second drip chamber adapted for connection with a source of medical fluid, the second drip chamber comprising a body with projection, and wherein the drip chamber support is

adapted to support the drip chamber bodies such that the projection on each of the drip chambers bodies is operatively associated with a fluid level sensor.

36. (Original) The fluid control device of claim 26 further comprising a pump for supplying a medical fluid to the patient via the fluid path set.

37. (Original) The fluid control device of claim 36 further comprising a shut-off valve associated with the pump for stopping flow of the medical fluid to the patient.

38. (Original) The fluid control device of claim 37 wherein the shut-off comprises an automated pinch valve.

39. (Original) The fluid control device of claim 36 wherein the pump comprises a peristaltic pump.

40. (Original) The fluid control device of claim 36 further comprising a fluid level sensing mechanism adapted to sense a level of medical fluid in a drip chamber associated with the fluid path set.

41. (Original) The fluid control device of claim 36 further comprising an air detector assembly operatively associated with the fluid path set.

42. (Original) The fluid control device of claim 36 further comprising guides for securing the fluid path set in association with the pump.

43. (Original) The fluid control device of claim 26 further comprising an air detector assembly operatively associated with the fluid path set.

44. (Original) The fluid control device of claim 43, wherein the air detector assembly comprises:

an air column detector adapted to detect the presence of air in medical tubing of the fluid path set; and

a retaining device for securing the medical tubing in operative association with the air column detector.

45. (Original) The fluid control device of claim 44 wherein the retaining device comprises:

a base adapted for association with the air column detector; and

a closure member connected to the base and adapted to secure the medical tubing in operative association with the air column detector.

46. (Original) The fluid control device of claim 45 wherein the closure member is movable from a closed position wherein the closure member secures the medical tubing in operative association with the air column detector, and an open position allowing the medical tubing to be disassociated from the air column detector

47. (Original) The fluid control device of claim 46 wherein the closure member is biased to the open position and secured in the closed position by a releasable locking mechanism.

48. (Original) The fluid control device of claim 46 wherein the closure member is secured in the closed position by a releasable locking mechanism.

49. (Original) The fluid control device of claim 45 wherein the closure member is formed of substantially clear plastic material to permit viewing of the medical tubing.

50. - 82. (Cancelled)

83. (New) An injector system comprising;
a source of injection fluid;
a pump device;

a fluid path set disposed between the source of injection fluid and the pump device, and comprising a multi-position valve; and

a fluid control device operatively associated with the fluid path set and comprising a valve actuator located to operate the multi-position valve, the valve actuator adapted to place the multi-position valve in a position to permit the injection fluid to be associated with the pump device and further adapted to close the multi-position valve to isolate the pump device from a patient and stop flow of the injection fluid to the patient at substantially any pressure or flow rate generated by the pump device for delivering a controlled sharp bolus of the injection fluid to the patient.

84. (New) The injector system of claim 83 wherein the valve actuator is further adapted to selectively place the pump device in fluid communication with the source of injection fluid for supplying the injection fluid to the pump device.

85. (New) The injector system of claim 83 wherein the valve actuator comprises a position indicator indicating a position of the multi-position valve.

86. (New) The injector system of claim 83 wherein the valve actuator comprises a sensor indicating presence of the multi-position valve in the valve actuator.

87. (New) The injector system of claim 83 wherein the valve actuator comprises a retainer for removably supporting the multi-position valve.

88. (New) The injector system of claim 83 wherein the fluid path set comprises a drip chamber and the fluid control device comprises a fluid level sensing mechanism operatively associated with the drip chamber for sensing the injection fluid level in the drip chamber.

89. (New) The injector system of claim 83 further comprising an air detector assembly operatively associated with the fluid path set.

90. (New) The injector system of claim 83 wherein the pump device comprises a powered injector.

91. (New) The injector system of claim 83, further comprising:
a source of medical fluid associated with the fluid path set; and
a pump operatively associated with the source of medical fluid for supplying the medical fluid to the patient via the fluid path set.

92. (New) The injector system of claim 91 wherein the fluid path set comprises a drip chamber and the fluid control device comprises a fluid level sensing mechanism operatively associated with the drip chamber for sensing the medical fluid level in the drip chamber.

93. (New) The injector system of claim 91 further comprising an air detector assembly operatively associated with the fluid path set.

94. (New) The injector system of claim 91 further comprising a shut-off valve associated with the pump for stopping flow of the medical fluid to the patient.

95. (New) The injector system of claim 94 wherein the shut-off comprises an automated pinch valve.

96. (New) The injector system of claim 91 wherein the pump comprises a peristaltic pump.

97. (New) The injector system of claim 91 wherein the fluid control device further comprises guides for securing the fluid path set in association with the pump.

98. (New) The injector system of 83, further comprising a hand held control device for controlling the flow rate of the injection fluid from the pump device.

99. (New) A fluid control device for connecting a pump device to a source of injection fluid comprising:

a fluid path set comprising a multi-position valve adapted to associate a patient and the source of injection fluid with the pump device; and

a valve actuator located to operate the multi-position valve, the valve actuator adapted to place the multi-position valve in a position to permit the injection fluid to be associated with the pump device and further adapted to close the multi-position valve to isolate the pump device from the patient.

100. (New) The fluid control device of claim 99 wherein the valve actuator comprises a position sensor indicator indicating a position of the multi-position valve.

101. (New) The fluid control device of claim 99 wherein the valve actuator comprises a sensor indicating presence of the multi-position valve in the valve actuator.

102. (New) The fluid control device of claim 99 wherein the valve actuator comprises a retainer for removably supporting the multi-position valve.

103. (New) The fluid control device of claim 99 further comprising a fluid level sensing mechanism adapted to sense a level of fluid in at least one drip chamber associated with the fluid path set.

104. (New) The fluid control device of claim 103 wherein the at least one drip chamber comprises a body with a projection, and the fluid level sensing mechanism further comprises:

a drip chamber support adapted to support the at least one drip chamber; and

at least one fluid level sensor associated with the drip chamber support, the drip chamber support adapted to support the at least one drip chamber such that the projection is operatively associated with the at least one fluid level sensor.

105. (New) The fluid control device of claim 104 wherein the projection extends longitudinally along the body.

106. (New) The fluid control device of claim 104 wherein the at least one fluid level sensor comprises an ultrasonic or optical fluid level sensor.

107. (New) The fluid control device of claim 104 wherein the drip chamber support is adapted to support the at least one drip chamber such that the projection is in contact with the at least one fluid level sensor.

108. (New) The fluid control device of claim 104 wherein the fluid path set comprises a second drip chamber adapted for connection with a source of medical fluid, the second drip chamber comprising a body with projection, and wherein the drip chamber support is adapted to support the drip chamber bodies such that the projection on each of the drip chambers bodies is operatively associated with a fluid level sensor.

109. (New) The fluid control device of claim 99 further comprising a pump for supplying a medical fluid to the patient via the fluid path set.

110. (New) The fluid control device of claim 109 further comprising a shut-off valve associated with the pump for stopping flow of the medical fluid to the patient.

111. (New) The fluid control device of claim 110 wherein the shut-off comprises an automated pinch valve.

112. (New) The fluid control device of claim 109 wherein the pump comprises a peristaltic pump.

113. (New) The fluid control device of claim 109 further comprising a fluid level sensing mechanism adapted to sense a level of medical fluid in a drip chamber associated with the fluid path set.

114. (New) The fluid control device of claim 109 further comprising an air detector assembly operatively associated with the fluid path set.

115. (New) The fluid control device of claim 109 further comprising guides for securing the fluid path set in association with the pump.